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Rural Water Supplies in South Dakota : Sanborn County

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Rural Water Supplies in South Dakota

SANBORN County

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RURAL WATER SUPPLIES

IN

SOUTH DAKOTA

SANBORN COUNTY

BY

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AND

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PREPARED BY THE WORK PROJECTS ADMINISTRATION AS A REPORT ON THE WELL SURVEY CONDUCTED AS WORK PROJECTS ADMINISTRATION OFFICIAL PROJECT 665-74-3-126; SPONSORED BY THE EXTENSION SERVICE AND THE EXPERIMENT STATION SOUTH DAKOTA STATE COLLEGE, IN COOPERATION WITH THE STATE GEOLOGICAL SURVEY.

JANUARY 1940

FOREWORD

This study was first proposed as a project of the Mineral Resources Committee of the State Planning Board under the direction of the State Geological survey and undertaken as a Work Projects Administration project sponsored by the State Planning Board, and was continued under the Planning Board until that body was abolished July 1, 1939 by the State Legislature. At that time sponsorship was transferred to the South Dakota Agricultural Experiment Station and the State College Extension Service, South Dakota State College. Field work was begun October 1, 1938 and was practically completed by February 15, 1939. Workers were assigned in the several counties under the supervision and direction of the County Agricultural Agents and Field Supervisors who were employed by the Work Projects Administration. Questionnaires were mailed out from the offices of the County Agents and were checked and tabulated in these offices. The material was then forwarded to the central office for final tabulation and analysis under the direction of Elmer E. Meleen and Walter V. Searight.

Particular credit should be given to the individual County Agricultural Agents in the various counties of the state who arranged the contacts with the individuals from whom these data were collected, furnished a large portion of the necessary supplies for field work, and directed the workers engaged in collecting field data. Without this assistance in gathering basic data, this study could not have been conducted. The value of the report is therefore in direct proportion to the accuracy and adequacy of these basic data.

INTRODUCTION

PURPOSE

This report on rural water supplies of South Dakota has been prepared to present data recently made available on the types and the sources of water supply, exclusive of stream, lake and dam waters. The information presented is of importance to evaluate present supplies. It should also prove useful as a basis for further development of supplies where they are needed or become necessary. Further, it is hoped that the facts presented may prove of value in any program of water conservation.

SOURCES OF INFORMATION

Questionnaires were sent to all, or essentially all of the farmers of the state, asking for complete data on farm wells and supplementary supplies, with the exception of the supplies above noted. A most gratifying number returned questionnaires, actually 60.1% average for the entire state. The coverage is probably more than 60.1% since it is likely that many unanswered inquiries were those to farmers who were without wells, the type of supply emphasized in the questionnaires. The data thus obtained were supplemented with information contained in the files of the State Geological Survey, the office of the State Engineer, and reports of the United States Geological Survey. This supplementary information, together with that contained in questionnaires was used in making the well location maps included in this report.

PROCEDURE

All data from the questionnaires were tabulated and analyzed statistically by counties, which were made the areal units of study. Within the county,

Acknowledgements - The authors wish especially to acknowledge and commend the conscientious assistance of Mr. E. L. Woodburn, Supervisor, for careful and painstaking supervision of statistical work. The authors also desire to express appreciation for the constant interest and support of this project by Mr. Bob Butts, Director of Research and Records Projects, South Dakota Work Projects Administration.

supplies were allocated as to kind on county maps. Since shallow waters are the most important source of rural supply in South Dakota, wells 200 feet deep and less were plotted on county maps from which maps indicating depths of wells by 50 foot intervals were made. Springs, shown on the well location map, and cisterns were also tabulated as important supplementary supplies, although the latter do not appear on maps or in the tables in this report.

PRESENTATION OF DATA

For convenience and utility, this report has been divided into sections each covering one county, and each county section bound separately. Each county report contains the following material wherever possible.

1. Well Location Map: This map shows the location of all wells and springs within the county, so far as information is now available. These have been plotted in such a manner that artesian and shallow wells can be differentiated readily by the reader. Artesian wells, where they occur, are divided into flowing and pumped. Artesian wells showing decreased flow and those reported as controlled are also indicated by symbols. Shallow wells are differentiated as adequate and inadequate, and dry holes as of 1938 are located. Wells from other sources of information other than questionnaires collected by this survey are shown in blue.

2. Shallow Well Map: This map shows, as accurately as possible, in 50 foot intervals, the depths at which shallow supplies are commonly obtained. Where shallow wells are abundant, as indicated by the well location map, the map is as accurate as the information on which it is based, but where such wells are sparsely distributed errors are likely to occur. In many places reports of shallow wells are absent in which case the area has been left blank.

3. Table of Pumped Wells, from 0 to 200 feet (inclusive) in depth: This table shows minimum, maximum, and average depths of wells within the county, as reported in the questionnaires. Tabulations are by townships. The general character of the water, hard, medium, and soft, as reported by farm-

ers, and the number of wells suitable or unsuitable for drinking are shown in this table. Further, the adequacy of supply, as indicated on the questionnaires, and use for irrigation are also shown here.

4. Table of Wells greater in depth than 200 feet: Minimum, maximum, and average depths are indicated. Character, reported as hard, medium or soft is tabulated. Adequacy and use for irrigation are shown as in the preceding table.

5. Table of Flowing Wells: Minimum, maximum, and average depths are shown together with general character and use for irrigation. The volume of flow as reported, and the number of flowing wells reported as equipped with control valves is also included in this table.

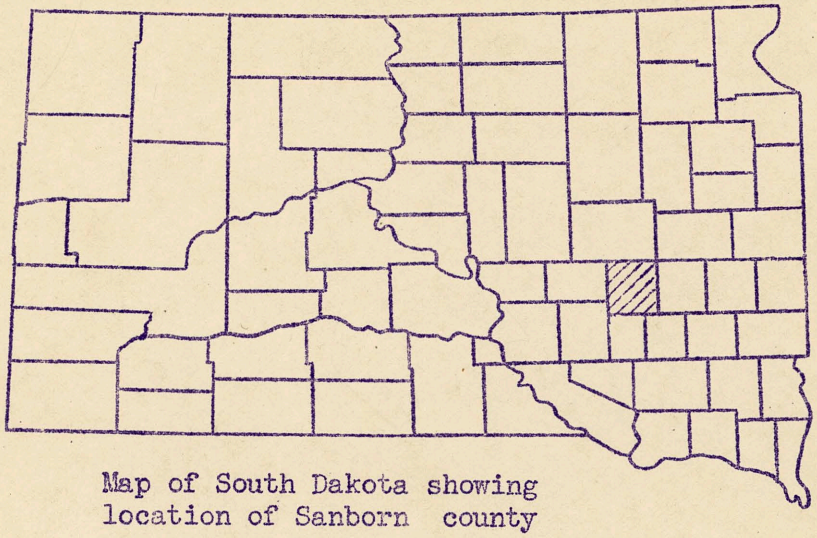
SUMMARY OF STATE SUPPLIES

In the entire state, a total of 48,479 wells were reported in response to questionnaires, returned by 60.1% of the recipients. If those who did not respond have a number of wells in proportion to those who reported, there are approximately 80,000 wells in South Dakota. There are possibly many less than this number since several counties with large numbers of wells returned over 75% of the questionnaires and since many farmers without wells did not reply because they were not requested to do so in the formal questionnaire. Of the wells reported, 16.2% are artesian, including both pumped and flowing wells. Shallow wells are 83.8% of the wells reported. Wells from shallow sources are thus obviously by far the most important means for obtaining water in rural South Dakota.

Important supplementary supplies are cisterns and springs. Roughly, there is more than one cistern to each 40 wells. Many springs are reported, however, in counties with very few wells, so that in some localities they are of considerable importance.

SANBORN COUNTY

Sanborn county lies in eastern South Dakota, south of the center of the eastern half of the state. It is bounded on the north by Beadle county, on the east by Miner, on the south by Davison and Hanson counties, and on the west by Jerauld and Aurora counties.



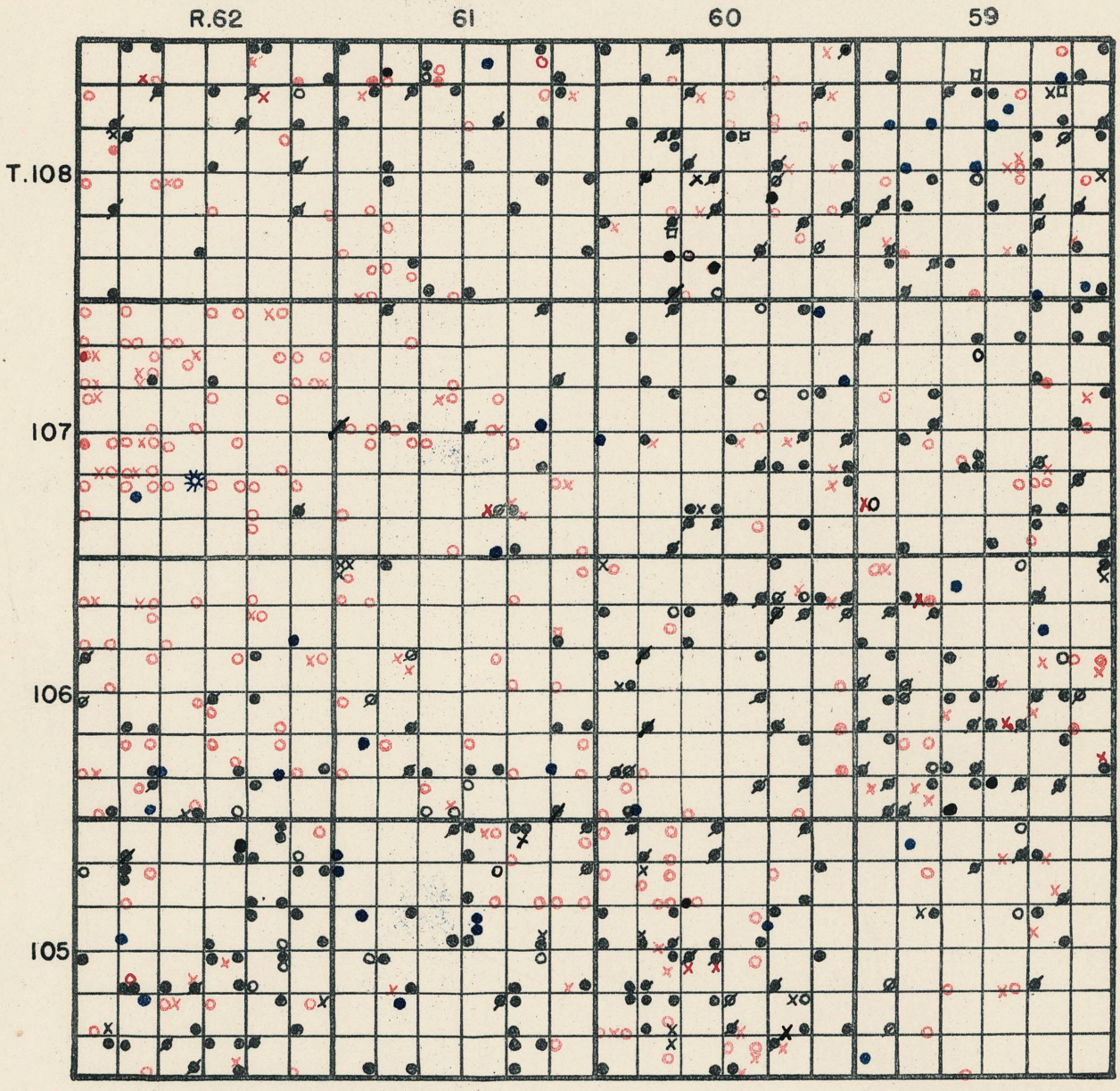
Map of South Dakota showing location of Sanborn county

Approximately 86 per cent of the area, 368,489 acres, is divided into 1067 farms averaging 345 acres to each farm unit. Corn, wheat, hay, oats and barley are the important field crops,the first three being of most importance. Livestock is important; cattle, sheep, and hogs being produced in the order named. Dairy products are also important.*

In areas where livestock, particularly dairy cattle and hogs are raised, and where farms are not unusually large, widely distributed sources of water are necessary. As a rule, supplies required are not large, but adequate and constant supplies of suitable water at relatively low cost are necessary to operate farms of the size and organization common to Sanborn county. The well distribution map indicates that, in general, water supplies are generally available and are widely distributed.

*South Dakota Agricultural Statistics Annual Report, 1937.

LOCATION OF ARTESIAN AND SHALLOW WELLS IN SANBORN COUNTY



ARTESIAN WELLS

- O FLOWING WELLS—STEADY OR INCREASING
- ● FLOWING WELLS—DECREASED FLOW
- X CEASED FLOWING
- □ PUMPED
- / CONTROLLED WELLS ⌀ ⌀

SHALLOW WELLS

- O ADEQUATE SUPPLY
- ● INADEQUATE SUPPLY
- X DRY WELLS
- □ SPRINGS

- ● WELLS FROM OTHER SOURCES
- ☼ CITY WELLS

DEPTH AND DISTRIBUTION

Well water is obtained at various depths in Sanborn county and both shallow wells, 200 feet or less in depth, and deep wells, are important. Owing to the ppsition of the county,near the southern end of the main area of artesian flow, flowing artesian wells are very important sources of supply.

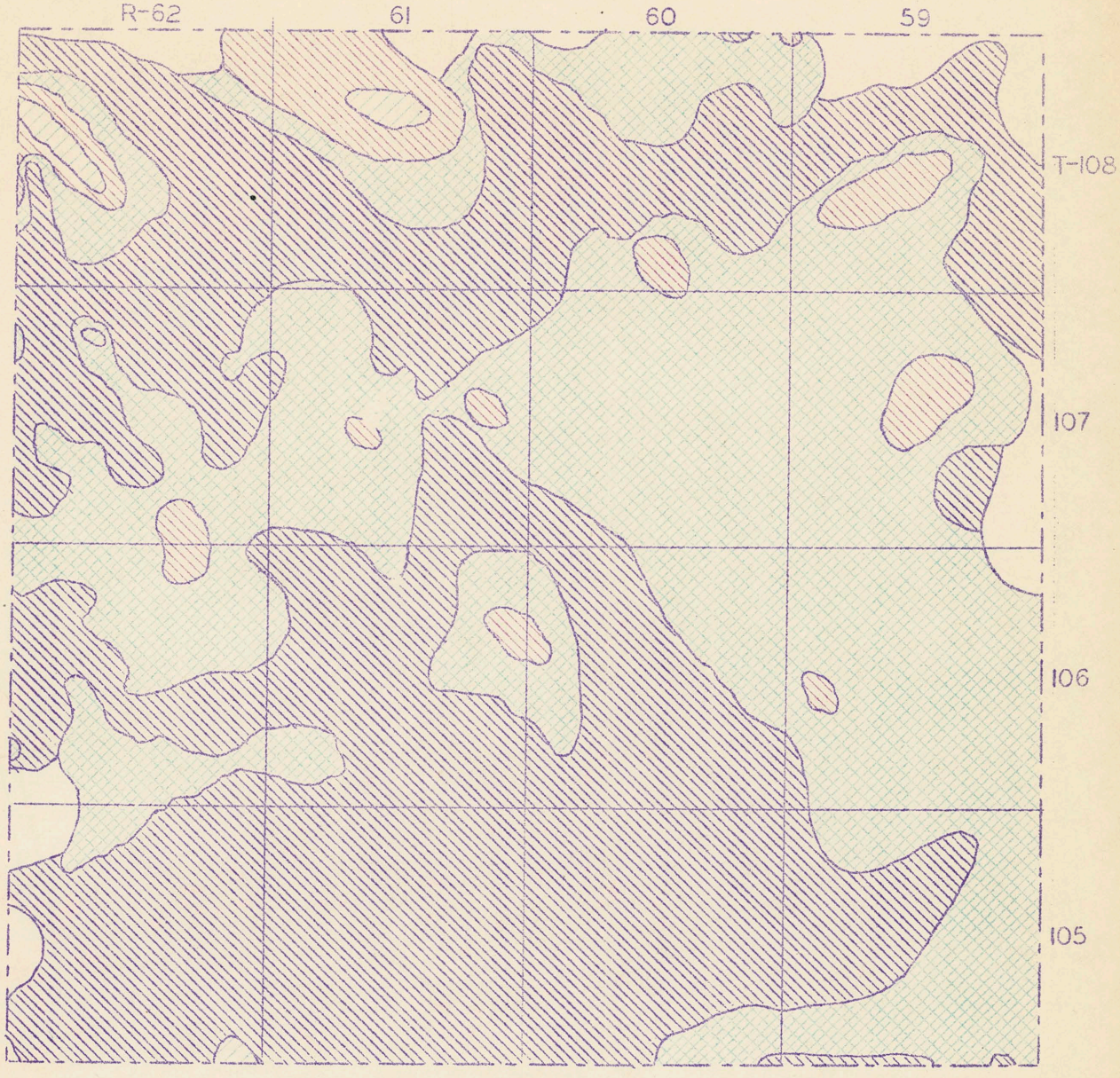
Reports were made by 56 per cent of the farmers to whom questionnaires were sent. They indicate that eight townships average somewhat more than one well per square mile, whereas eight townships report more than that average. One townships, T.105N., R.59W., reported only 18 wells, or one well to two square miles.

Shallow wells: Approximately one third of the wells of Sanborn county are shallow pumped wells, 211 of a total of 625, or 33.7 per cent. These differ from most of the shallow wells of eastern South Dakota in that most of them terminate, not in glacial deposits, but in sandstone of Cretaceous age, probably the Codell sandstone, and many of the pumped shallow wells appear to be artesian wells. Because of the source few of them are extremely shallow and they increase in number with depth. Thus, only 1.9 per cent of those reported are between 0 and 50 feet in depth, 7.8 per cent range from 50 to 100 feet, 33.3 per cent are from 100 to 150 feet deep, and more than half,57.1 per cent, are from 150 to 200 feet deep. Thus, 90.4 per cent of the shallow wells obtain water 100 to 200 feet below the surface according to reports. On the shallow well map the areas at which shallow wells obtain water have been mapped on 50 foot depth intervals. It shows in a striking manner the considerable areas which obtain shallow water at considerable depths, 100 to 200 feet deep.

Deep pumped wells supply only a small part of the well water used on farms in Sanborn county. Only 5.4 per cent of all wells reported were deep pumped wells. They occur mostly in the southern half of the county, since 24 of the 34 are reported there.

Flowing wells are probably the most important source of rural water sup-

SANBORN COUNTY



SHALLOW WELLS (0-200FT)

DEPTHS AT WHICH SUPPLIES ARE COMMONLY OBTAINED

0-50FT

50-100FT

100-150FT

150-200FT

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ply of the county. They are considerably more than half, 60.8 per cent, of all wells reported in the county. Of all flowing wells reported in the county, 23.7 per cent are shallow flowing wells and 76.3 per cent are deep flowing wells. The area in which flowing wells are obtained is shown on the artesian map of Sanborn county and the relation of this area to that of the state is shown on the artesian map of South Dakota.

In order to show the relative importance of deep wells, most of them flowing, in Sanborn county, they have been tabulated by township in the table which follows:

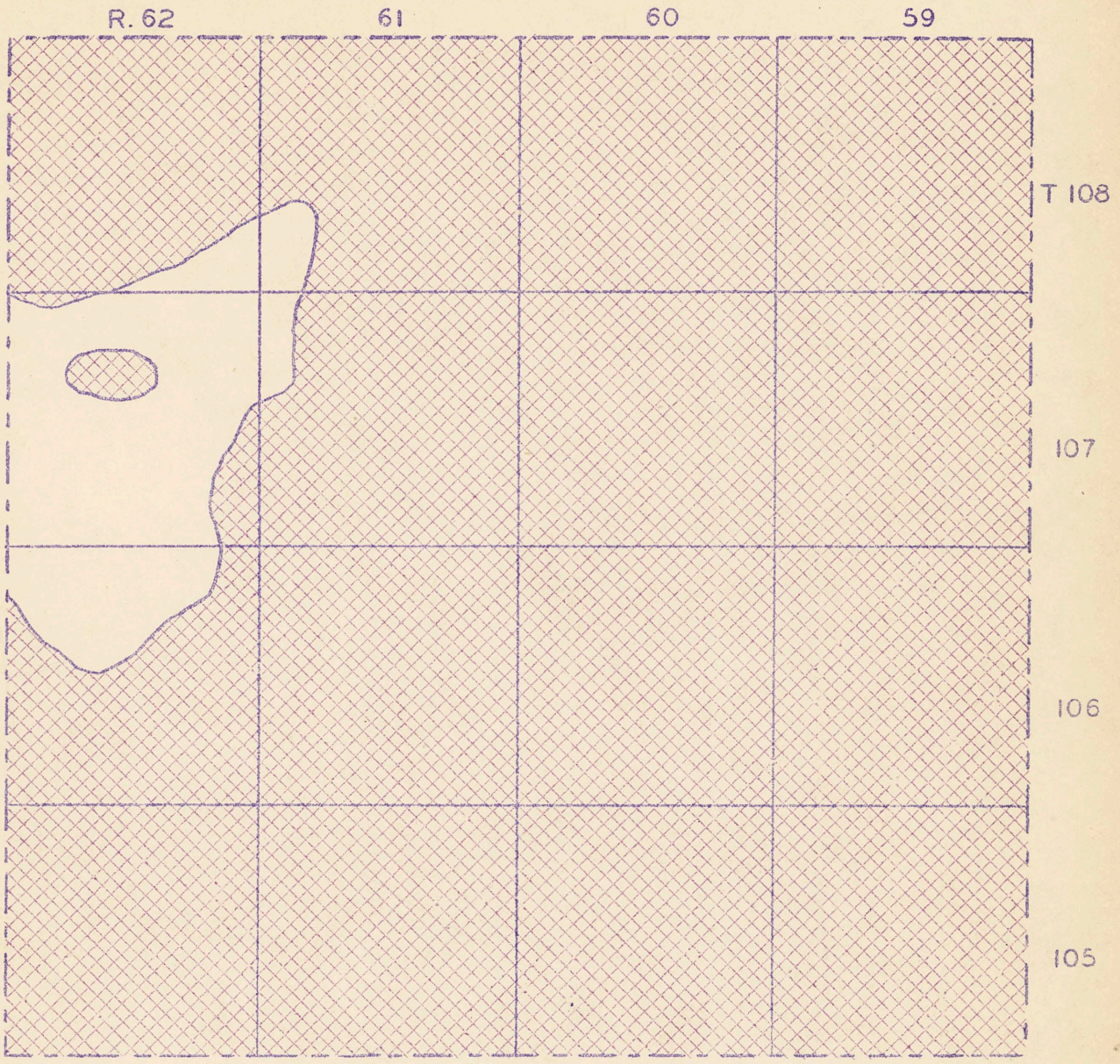
Twp.	Rge.	Total Number of Wells	Per cent of All Wells	Depths Minimum	Depths Maximum
105N	59W	11	61.1	166	600
105	60	30	47.2	196	650
105	61	17	47.3	140	680
105	62	28	52.8	260	811
106	59	22	45.8	80	900
106	60	24	61.5	60	792
106	61	19	55.9	96	700
106	62	17	40.5	235	740
107	59	20	57.1	80	900
107	60	21	75.	100	800
107	61	9	33.3	137	740
107	62	3	6.1	740	1300
108	59	31	75.7	80	1100
108	60	30	65.2	80	1100
108	61	22	57.9	675	871
108	62	20	66.7	600	810

The volume of flow which was reported for all the flowing wells varied from an average per township of 2.9 gallons to 17.5 gallons per minute. A considerable number, 120, were reported to be equipped with control valves.

CHARACTER OF WELL WATERS

In order to determine the character of well waters of Sanborn county the farmer was asked whether water supplied by his well was considered to be hard, moderately hard, or soft and whether the water was satisfactory for drinking. Although chemical analyses, the most satisfactory basis for judgment, are not commonly available to farmers, usage is probably a fairly good criterian of the general character of water.

ARTESIAN AREAS 1938



SANBORN COUNTY

☒ FLOWING WELLS

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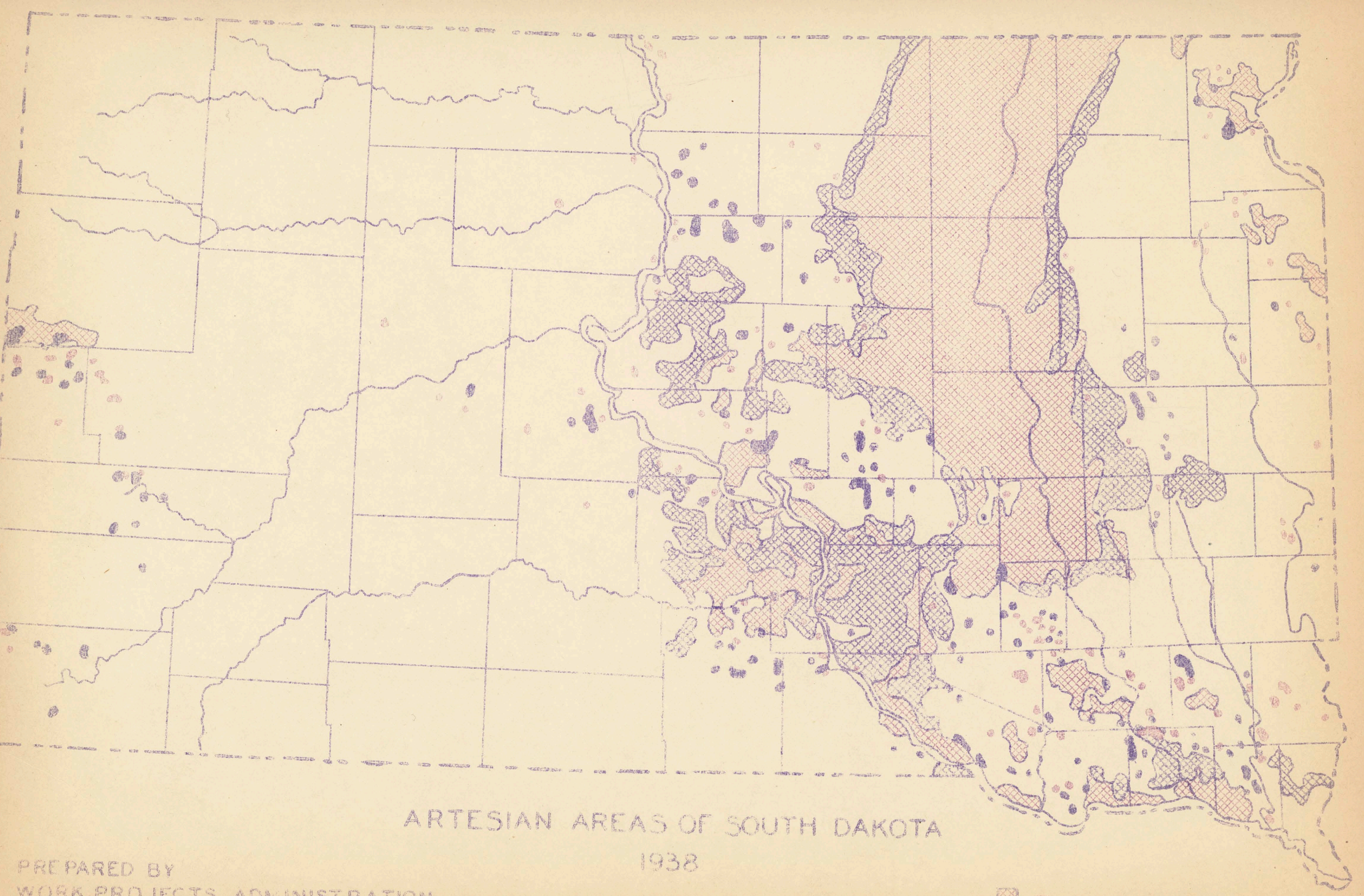

ARTESIAN AREAS OF SOUTH DAKOTA

1938

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W.P. 3636

FLOWING WELLS

PUMPED ARTESIAN WELLS

Over most of eastern South Dakota shallow wells produce hard water. Those of Sanborn county, however, because of the difference in source, commonly produce soft water. This view is well supported by reports which indicate that 66.7 per cent were soft, 16.9 per cent moderately hard, and 16.4 per cent were definitely hard. Thus, 83.6 per cent of the shallow waters were reported soft or only moderately hard. An unusually large number is reported to be satisfactory for drinking, since only three per cent are reported unsatisfactory.

The deep pumped wells and the flowing wells, which are mostly deep, differ somewhat from the shallow wells in that among both less soft water wells occur.

Deep pumped wells are reported to be 33.3 per cent hard, 22.2 per cent moderately hard, and 45.5 per cent, not quite half, soft. The users of water from flowing wells report that 31 per cent were hard, 29 per cent moderately hard, and 40 per cent were soft. Twelve per cent of the deep flowing wells were reported unsuitable for drinking.

ADEQUACY OF SUPPLY

In general, water supplies of Sanborn county from wells are adequate for current farm use. Users of shallow well waters report only six per cent to be inadequate. This is an unusually low percentage. Deep pumped wells, on the other hand, appear to be a most unreliable source, since 68 per cent of those reported were inadequate for farm use. Farmers and owners of Sanborn county are advised not to drill additional deep wells from which water is likely to be pumped without consulting a responsible, informed, and qualified agency. Flowing wells are mostly adequate, with 12 per cent reported not adequate for current farm use.

IRRIGATION

Water from wells is used to irrigate small plots such as farm gardens.

Fifteen shallow wells were used to irrigate a total of 4 1/8 acres in plots varying from 1/4 to 1 1/4 acres. Only one deep pumped well was used to irrigate 1/4 acres, and 58 flowing wells were used to irrigate a total of 24 5/8 acres in plots ranging from 1/4 to 8 1/4 acres

SUPPLEMENTARY WATER SUPPLIES

Springs and cisterns are supplementary water supplies most commonly used over eastern South Dakota. Springs appear to be unimportant in Sanborn county since but one is reported.

Cisterns are extensively used, especially where well water is hard, unsatisfactory for drinking, or inadequate. In Sanborn county they are less common than in most parts of eastern South Dakota, probably because of the very numerous soft water wells. Only one cistern to 13 wells is reported in the county. In T.108N., the average is aproximately one cistern to every seven wells.

SANBORN COUNTY

Table 1.

DATA ON PUMPED WELLS FROM 0 TO 200 FEET (INCL.) IN DEPTH

LOCATION		Number of Wells	DEPTH OF WELLS			CHARACTER OF WATER					ADEQUACY OF SUPPLY			
Twp.	Rge.		Min.	Max.	Ave.	Hard	Med	Soft	Corrode Casing	Unsuitable for Drinking	Adequate	Inade-quate	Number used for Irrigation	Approximate Acres Irrigated
105	59	5	120	184	145	1	4	-	1	-	5	-	1	1/2
105	60	16	150	180	161	-	1	14	-	1	16	-	2	3/8
105	61	8	160	185	172	-	1	7	-	-	8	-	-	-
105	62	9	30	200	149	-	2	7	-	-	9	-	-	-
106	59	7	130	150	151	6	-	-	2	1	5	2	-	-
106	60	10	125	200	159	1	2	6	-	-	8	2	-	-
106	61	14	140	180	157	-	2	12	-	1	14	-	2	1/4
106	62	25	75	195	148	1	4	20	1	1	25	-	2	1/4
107	59	8	111	162	143	7	-	-	-	-	7	1	-	-
107	60	2	125	150	137	1	-	1	1	-	2	-	-	-
107	61	16	75	180	137	-	1	15	-	-	16	-	-	-
107	62	46	16	175	147	3	9	32	2	1	44	2	2	1/2
108	59	8	100	200	152	1	2	3	2	-	6	2	-	-
108	60	12	110	190	158	7	1	3	1	-	12	-	4	1
108	61	15	60	200	127	3	2	9	-	1	13	2	2	1 1/4
108	62	10	12	200	121	2	3	5	2	1	8	2	-	-
Total		211				33	34	134	12	7	198	13	15	4 1/8

SANBORN COUNTY

Table 2.

DATA ON PUMPED WELLS OVER 200 FEET IN DEPTH

LOCATION			DEPTH OF WELLS			CHARACTER OF WATER					ADEQUACY OF SUPPLY			
Twp.	Rge.	Number of Wells	Min.	Max.	Ave.	Hard	Med.	Soft	Corrode Casing	Unsuitable for Drinking	Adequate	Inade-quate	Number used for Irrigation	Approximate Acres Irrigated
105	59	1	428	428	428	-	-	-	-	-	-	1	-	-
105	60	8	300	640	469	1	1	-	-	-	2	6	-	-
105	61	2	630	630	630	-	-	-	-	-	-	2	-	-
105	62	3	300	500	400	1	-	-	-	-	1	2	-	-
106	59	1	750	750	750	-	-	-	-	-	-	1	-	-
106	60	2	750	760	755	-	-	-	-	-	-	2	-	-
106	61	5	240	700	508	-	-	2	-	-	2	3	-	-
106	62	2	236	450	342	-	-	1	-	-	1	1	1	1/4
107	59	1	250	250	250	-	-	-	-	-	1	-	-	-
107	60	1	700	700	700	-	-	-	-	-	-	1	-	-
107	61	None	-	-	-	-	-	-	-	-	-	-	-	-
107	62	None	-	-	-	-	-	-	-	-	-	-	-	-
108	59	4	400	800	586	1	-	1	1	-	2	2	-	-
108	60	3	600	790	705	-	1	-	-	-	2	1	-	-
108	61	None	-	-	-	-	-	-	-	-	-	-	-	-
108	62	1	728	728	728	-	-	-	-	-	-	1	-	-
Total		34				3	2	4	1	-	11	23	1	1/4

SANBORN COUNTY

Table 3.

DATA ON FLOWING WELLS

LOCATION		Number of Wells	DEPTH OF WELLS			CHARACTER OF WATER					ADEQUACY OF SUPPLY					
Twp.	Rge		Min.	Max.	Ave.	Hard	Med.	Soft	Corrode Casing	Unsuitable for Drinking	Adequate	Inadequate	Number used for Irrigation	Approx. Acres Irrigated	Ave. Gallon Per Min	Number Controlled
105	59	12	166	600	433	12	-	-	6	-	11	1	1	2	5.37	5
105	60	37	196	650	491	24	10	1	11	3	36	1	5	2 3/4	10.32	11
105	61	26	140	680	477	7	6	12	6	-	16	10	2	-	8.10	4
105	62	41	260	811	506	6	14	18	7	3	39	2	5	7/8	3.81	4
106	59	40	80	900	523	14	4	21	11	1	37	3	3	1 1/4	5.67	17
106	60	27	60	792	492	5	10	11	3	-	23	4	5	3/4	11.26	11
106	61	15	96	686	511	1	2	11	1	-	14	1	2	1/4	7.0	5
106	62	15	350	740	551	10	1	3	4	2	15	-	2	1 1/4	7.63	4
107	59	26	80	900	585	7	7	12	4	1	22	4	2	1/4	6.33	6
107	60	25	100	800	579	10	7	6	5	2	20	5	3	3/8	2.09	7
107	61	11	137	740	513	-	3	8	1	1	11	-	2	1 1/8	12.50	5
107	62	3	740	1300	1020	1	2	-	1	1	3	-	2	2 1/8	17.50	1
108	59	29	80	1100	757	2	10	15	2	-	23	6	3	8 1/4	8.45	12
108	60	31	80	1100	664	9	12	7	3	1	26	5	10	1 1/4	8.88	18
108	61	23	675	871	784	3	8	9	5	-	22	1	3	1	5.37	2
108	62	19	600	810	718	2	7	9	4	1	16	3	8	1 1/8	5.50	8
Total		380				113	103	143	74	16	334	46	58	24 5/8	-	120

Sanborn County Well Notes

The following are pertinent remarks quoted from questionnaires returned by farmers and are included opinions of the water situation as expressed by the individual farmers and must be so applied.

T.105N., R.61W. SW¼ Sec. 26	600 feet: (artesian) "Difficulty in construction account of granite rock."
T.106N., R.61W. SW¼ Sec. 6	180 feet: "We had difficulty with artesian wells. Four different flowing wells were drilled near this site and each turned into a mud flow. Each time the caseing was corroded out. That is why we put down a shallow well."
T.106N., R.61W. NE¼ Sec. 15	250 feet: "Water is yellow and rusty at first until 6 or 8 buckets after it becomes clear. Sometimes it also has an odor and contains considerable alkali."
T.106N., R.62W. NW¼ Sec. 19	740 feet: (artesian) "I have drilled four wells in thirty years on this farm account the water eats out pipe."
T.108N., R.59W. SE¼ Sec. 15	100 feet: "We dug at least 12 wells before we got water that was fit to use. They were shallow or surface water wells."
T.108N., R.59W. SW¼ Sec. 22	750 feet: (artesian) "The difficutly in constructing wells is in getting through a bed of some kind of rock which is believed to be granite. It is down about 800 ft. There has been two or three wells lost while drilling."
T.108N., R.59W. SE¼ Sec. 30	735 feet: (artesian) "The first vein of water is 80 ft., the second is 160 ft., the third is 300 ft., the fourth 600 ft. which is soft water and fifth 730 ft. No trouble getting plenty of water."
T.108N., R.60W. NW¼ Sec. 12	750 feet: (artesian) "Water has strong taste and is very hard on stomach."
T.108N., R.61W. NE¼ Sec. 2	150 feet: "Water is fit only for washing. Has been condemned twice by Brookings as unfit to drink. It eats up aluminum. Also cannot be used for stock water. We have an artesian well which is O. K. for drinking purposes."

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